

Life-threatening Migration of ALN Inferior Vena Cava Filter to Right Ventricle

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Abstract

A 40-year-old man underwent emergent pulmonary artery thromboembolism, and an ALN filter was placed in the inferior vena cava immediately after the operation. He had sudden ventricular tachycardia with dyspnea on postoperative day 6. An emergent operation was successfully performed, and the ALN filter was observed at the tricuspid valve with a large amount of the thrombus. Migration of the inferior vena cava filter to the right ventricle is a life-threatening complication that may result from residual deep vein thrombosis.

Keywords: Pulmonary embolism; Vena cava filter; Filter migration; Right ventricle

Introduction

An inferior vena cava (IVC) filter is often placed to prevent recurrent pulmonary thromboembolism (PTE), which is a major cause of death in patients suffering from deep vein thrombosis (DVT). There are various complications after placing an IVC filter. The incidence of filter migration, defined as <2-cm displacement from the initial location, is reportedly 1.3% [1]. However, major migration, such as that to the heart, is a rare but life-threatening complication [2-4]. We herein report a patient who underwent emergent operation for IVC filter migration to the heart.

Case

A 40-year-old man was admitted to our hospital suffering from shortness of breath on January 28, 2012. A thrombus was detected in his right atrium by echocardiography, and a large portion of the thrombus was present in the bilateral pulmonary arteries on computed tomography (CT). He was diagnosed with PTE with DVT in his right leg and underwent an emergent operation. Under deep hypothermic circulatory arrest, bilateral pulmonary thromboembolism was performed. Immediately after the operation, an ALN IVC filter (ALN 030-28J; ALN Implants Chirurgicaux, Bormes les Mimosas, France) was placed to prevent additional PTE.

He suddenly developed dyspnea with premature ventricular contraction on postoperative day 6. CT revealed migration of the IVC filter to the right ventricle with recurrent bilateral PTE (Figure 1). Furthermore, the thrombus at the right iliac vein detected with preoperative CT had disappeared, and a new DVT at the left iliac vein was present.

Cardiopulmonary bypass was established with the ascending aorta and bicaval cannulation. After cardioplegic arrest, right atriotomy was performed, and the IVC filter with a massive amount of fresh thrombus was observed (Figure 2). The IVC filter was tangled with the anterior and septal chordae tendinae; therefore, it was removed carefully without any damage to the tricuspid valve. Bilateral pulmonary arterial thromboembolism was again performed under deep hypothermic circulatory arrest. A Günther Tulip filter (Cook Medical Inc., Bloomington, IN) was then placed in the IVC to prevent further PTE. Intravenous systemic heparinization was started immediately postoperatively and was overlapped until the warfarin potassium

achieved an adequate anticoagulation effect. The Günther IVC filter was removed on postoperative day 16 after the iliac vein thrombus had disappeared by warfarinization. Warfarinization was continued long-term.

Discussion

IVC filters placed to prevent recurrent PTE due to DVT are now frequently used because of improvement of the device [5]. However, permanent placement can cause critical complications such as occlusion of the IVC. Therefore, retrievable filters, which can be removed when they become unnecessary, are frequently used. Newer retrievable IVC filters reportedly have a higher incidence of major migration to the heart compared with older stainless steel or titanium-based IVC filters [6]. In this report, it was concluded that migration of newer IVC filters

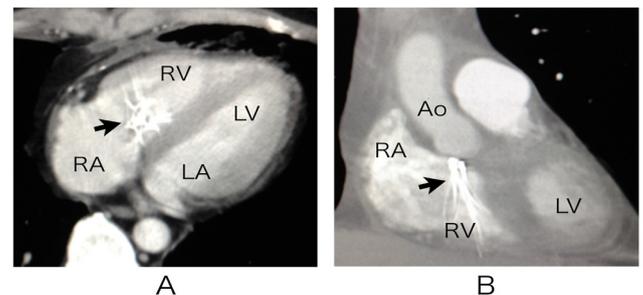


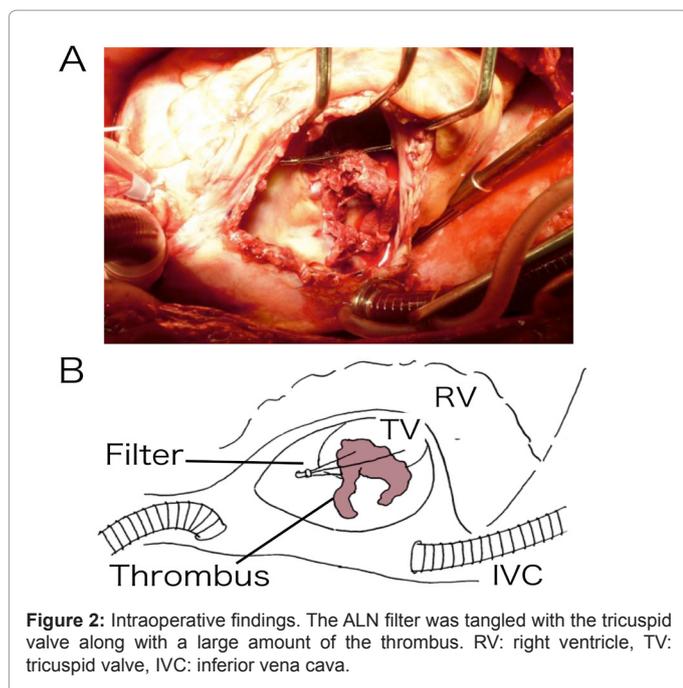
Figure 1: Computed tomography. The IVC filter was confirmed at the tricuspid valve. Black arrow indicates the IVC filter. RV: right ventricle, RA: right atrium, LV: left ventricle, Ao: ascending aorta.

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Received December 12, 2013; Accepted December 23, 2013; Published December 26, 2013

Citation: Ryomoto M, Mitsuno M, Tanaka H, Fukui S, Miyamoto Y (2013) Life-threatening Migration of ALN Inferior Vena Cava Filter to Right Ventricle. J Vasc Med Surg 1: 122 doi: 10.4172/2329-6925.1000122

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may have resulted from the fact that they are readily conformable even in warm conditions, such as at human body temperature. According to the Manufacturer and User Facility Device Experience (MAUDE) database (January 2000 through December 2010) of the United States Food and Drug Administration, the incidence of migration (defined as >2-cm displacement from the initial location) was 1.3% [1].

The ALN filter (ALN Implants Chirurgicaux, Bormes les Mimosas, France), which was used in our case, is a hydrodynamic retrievable IVC filter made from AISI 316 L stainless steel. It is characterized by six short legs that can adhere to the IVC wall and three long legs that can stabilize in the central position along the main axis of the vena cava [7]. There is only one case report of major migration in which the ALN filter migrated significantly to the proximal IVC just below the right atrium. This patient had been asymptomatic, and the migration was found on the scheduled day of retrieval [8].

Major migration of the filter to the heart is a rare but life-threatening complication involving chest pain, syncope, and ventricular tachycardia as the presenting symptoms [6]. A case of filter migration to the right ventricle 6 days after placement with subsequent death from ventricular fibrillation has been reported [3]. Another reported case involved destruction of the tricuspid valve by migration of the IVC filter. The patient complained of chest pain with an episode of ventricular tachycardia 1 week after implantation; migration was confirmed by CT [2]. Close examination of the filter location by routine abdominal X-ray is important because migration is not found until symptoms appear.

The most appropriate surgical approach should be considered once the filter has migrated to the right ventricle because the filter can

very easily become tangled with the tricuspid valve chordae tendinae, causing a life-threatening complication such as ventricular tachycardia. Surgical removal of the OPTASE IVC filter (Cordis Endovascular, Bridgewater, NJ, USA) with concomitant tricuspid cusp repair [4] or tricuspid valve replacement [2] has been reported. Our case is the first surgical report regarding filter removal for life-threatening ALN filter migration to the heart. In our case the filter was successfully extracted with no damage to the tricuspid apparatus.

One cause of migration could be change in the IVC caliber because of increased central venous pressure [8]. In our case, a large amount of thrombus remained in the right iliac vein with inadequate anticoagulation after IVC filter placement. The migration may have occurred by increased venous pressure in the IVC because of trapping of the thrombus. Because the IVC filter is not enough to manage a large amount of deep vein thrombus, we should routinely begin adequate anticoagulation therapy, including intravenous administration of heparin sodium and oral warfarin potassium, immediately after insertion of the IVC filter as performed after the second operation in this report.

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